

Application No. 09/608,856

Jin Yang

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IN THE CLAIMS

Following are the claims as currently pending for consideration.

1-2. (Cancelled)

3. (Currently Amended) ~~The computer software product recited in Claim 1~~ A computer software product including one or more recordable media having executable instructions stored thereon which, when executed by a processing device, causes the processing device to strengthen a first antecedent label for an edge in an assertion graph, wherein strengthening the antecedent label comprises causing the processing device to:

join any pre-images for antecedent labels of outgoing edges from the edge in the assertion graph; and

keep in the strengthened antecedent label for the edge only what is already contained by the first antecedent label for the edge and also contained by the joined pre-images for antecedent labels of outgoing edges from the edge.

4. (Currently Amended) The computer software product recited in Claim 1 ~~3~~ which, when executed by a processing device, further causes the processing device to:
- compute a simulation relation for the edge from the strengthened antecedent label;
- and
- compare the simulation relation for the edge to a consequence label for the edge.

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5. (Original) The computer software product recited in Claim 4 wherein computing the simulation relation comprises causing the processing device to:

identify in the strengthened antecedent label of the edge any states that are also contained by a post-image for a simulation relation of an edge incoming to the edge in the assertion graph; and

join to the simulation relation for the edge, the identified states.

6. (Original) The computer software product recited in Claim 4 wherein comparing the simulation relation to a consequence label comprises causing the processing device to:

determine whether the simulation relation for the edge is contained by the consequence label for the edge.

7. (Original) The computer software product recited in Claim 4 wherein comparing the simulation relation to a consequence label comprises causing the processing device to:

negate a Boolean expression of the simulation relation for the edge, and:

logically combine the negated Boolean expression with a Boolean expression of the consequence label for the edge using a logical OR operation.

8. (Original) The computer software product recited in Claim 4 wherein computing a simulation relation for the edge from the strengthened antecedent label comprises causing the processing device to:

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compute a simulation relation abstraction for the edge; and
concretize the simulation relation abstraction for the edge to produce the
simulation relation for the edge.

9. (Original) The computer software product recited in Claim 8 wherein computing a simulation relation for the edge from the strengthened antecedent label further comprises causing the processing device to:
- abstract the strengthened antecedent label to produce an antecedent label abstraction for the edge; and
 - use the antecedent label abstraction to compute the simulation relation abstraction for the edge.

10. (Canceled)

11. (Currently Amended) ~~The method recited in Claim 10~~ A method comprising strengthening a first antecedent label for an edge in an assertion graph, wherein strengthening the antecedent label comprises:
- joining pre-images of antecedent labels of any outgoing edges from the edge in the assertion graph; and
 - keeping, in the strengthened antecedent label for the edge, states already contained by the first antecedent label for the edge and also contained by the joined pre-images of antecedent labels of any outgoing edges from the edge.

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12. (Currently Amended) The method recited in Claim ~~10~~ 11 wherein the first antecedent label is one of a plurality of antecedent labels including a second antecedent label encoded along with the first antecedent label into a third antecedent label by a symbolic indexing function.

13. (Currently Amended) The method recited in Claim ~~10~~ 11 further comprising:
 computing a simulation relation for the edge from the strengthened antecedent label; and
 comparing the simulation relation for the edge to a consequence label for the edge.

14. (Original) The method recited in Claim 13 wherein comparing the simulation relation to a consequence label comprises:
 determining whether the simulation relation for the edge is contained by the consequence label for the edge.

15. (Original) The method recited in Claim 13 wherein comparing the simulation relation to a consequence label comprises:
 negating a Boolean expression of the simulation relation for the edge, and:
 logically combining the negated Boolean expression with a Boolean expression of the consequence label for the edge using a logical OR operation.

16-20. (Cancelled)

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21. (Currently Amended) ~~The verification system of Claim 20~~ A verification system comprising means for strengthening a first antecedent label for an edge in an assertion graph, wherein the means for strengthening the antecedent label comprises:
- means for joining any pre-images for antecedent labels of outgoing edges from the edge in the assertion graph; and
 - means for keeping, in the strengthened antecedent label for the edge, states already contained by the first antecedent label for the edge and also contained by the joined pre-images for antecedent labels of outgoing edges from the edge.
22. (Currently Amended) The verification system of Claim ~~20~~ 21 wherein the first antecedent label is one of a plurality of antecedent labels including a second antecedent label encoded along with the first antecedent label into a third antecedent label by a symbolic indexing function.
23. (Currently Amended) The verification system of Claim ~~20~~ 21 further comprising:
- means for computing a simulation relation for the edge from the strengthened antecedent label; and
 - means for comparing the second simulation relation for the edge with a consequence label for a corresponding edge in a second assertion graph to check if the second simulation relation is contained by the consequence label.

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24. (Original) The verification system of Claim 23 wherein the means for comparing the simulation relation to a consequence label comprises:

means for determining whether the simulation relation for the edge is contained by the consequence label for the edge.

25– 29. (Cancelled)

30. (Currently Amended) ~~The verification system of Claim 29 wherein the plurality of executable instructions, when executed by the processing device, further causes A~~
verification system comprising:

a recordable medium to store executable instructions;

a processing device to execute instructions; and

a plurality of executable instructions that when executed by the processing device,

cause the processing device to:

strengthen an antecedent label for an edge in an assertion graph;

compute a first simulation relation for the edge; and

concretize the first simulation relation computed for the edge to produce a second simulation relation for the edge.

31. (Currently Amended) The verification system of Claim 29 30 wherein the plurality of executable instructions, when executed by the processing device, further cause the processing device to:

compute a first simulation relation using the strengthened antecedent label; and

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verify a justification property of the assertion graph from the first simulation relation.

32. (Previously Presented) A verification system comprising:

a recordable medium to store executable instructions;
a processing device to execute instructions; and
a plurality of executable instructions that when executed by the processing device, cause the processing device to strengthen one or more antecedents representing pre-existing states and stimuli for an assertion, and to verify a justification property of the assertion using the one or more strengthened antecedent.

33. (Previously Presented) The verification system of claim 32, wherein the one or more antecedents are strengthened by propagating future antecedents backwards.

34. (Previously Presented) The verification system of claim 32, wherein the justification property is verified by computing a simulation relation using the one or more strengthened antecedents and comparing the simulation relation to one or more consequences representing possible resulting states for the assertion.

35. (Previously Presented) A method comprising:

expressing a justification property with an assertion having at least one antecedent to represent pre-existing states and stimuli for a finite state machine, and also having at least one consequence to represent possible resulting states for the finite state

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machine;

strengthening said at least one antecedent of the assertion, and

verifying said justification property using the at least one strengthened antecedent and said at least one consequence.

36. (Previously Presented) The method of claim 35, wherein the justification property is verified by computing a simulation relation sequence using the at least one strengthened antecedent and comparing the simulation relation sequence at least in part to said at least one consequence.

37. (Previously Presented) The method of claim 35, said verification of the justification property comprising:

- computing a simulation relation abstraction for the assertion; and
- concretizing the simulation relation abstraction to produce the simulation relation for the assertion.

38. (Previously Presented) The method of claim 37, wherein the justification property is verified by comparing the simulation relation at least in part to said at least one consequence.

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